




# UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/723,987	11/26/2003	Alexei A. Erchak	16459-006001 / LD-4	7973
26161	7590	12/22/2004	EXAMINER	
FISH & RICHARDSON PC 225 FRANKLIN ST BOSTON, MA 02110			LEWIS, MONICA	
			ART UNIT	PAPER NUMBER
			2822	

DATE MAILED: 12/22/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

<p align="center"><b>Office Action Summary</b></p>	<b>Application No.</b> 10/723,987	<b>Applicant(s)</b> ERCHAK ET AL.	
	<b>Examiner</b> Monica Lewis	<b>Art Unit</b> 2822	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 29 September 2004.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-77 is/are pending in the application.
- 4a) Of the above claim(s) 27-74, 76 and 77 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-26 and 75 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 November 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>9/04</u> . | 6) <input type="checkbox"/> Other: _____  |

### **DETAILED ACTION**

1. This office action is in response to the election filed September 29, 2004.

#### ***Specification***

2. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

#### ***Election/Restrictions***

3. Applicant's election without traverse of Group I in the reply filed on 9/29/04 is acknowledged.

#### ***Drawings***

4. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: a) 146 (See Figure 1); b) 606 (Figure 17); and c) 136 (See Figure 1). Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

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5. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the following must be shown or the feature(s) canceled from the claim(s): a) a p-ohmic contact layer between the layer of p-doped material and the layer of reflective material (See Claim 8); and b) the pattern extends beyond the first layer (See Claim 14). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

***Specification***

6. Applicant is reminded of the proper content of an abstract of the disclosure.

A patent abstract is a concise statement of the technical disclosure of the patent and should include that which is new in the art to which the invention pertains. If the patent is of a basic nature, the entire technical disclosure may be new in the art, and the abstract should be directed to the entire disclosure. If the patent is in the nature of an improvement in an old apparatus, process, product, or composition, the abstract should include the technical disclosure of the improvement. In certain patents, particularly those for compounds and compositions, wherein the process for making and/or the use thereof are not obvious, the abstract should set forth a process for making and/or use thereof. If the new technical disclosure involves modifications or alternatives, the abstract should mention by way of example the preferred modification or alternative.

The abstract should not refer to purported merits or speculative applications of the invention and should not compare the invention with the prior art.

Where applicable, the abstract should include the following:

- (1) if a machine or apparatus, its organization and operation;
- (2) if an article, its method of making;
- (3) if a chemical compound, its identity and use;
- (4) if a mixture, its ingredients;
- (5) if a process, the steps.

Extensive mechanical and design details of apparatus should not be given.

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7. The abstract of the disclosure is objected to because it does not appear to be a concise statement of the technical disclosure of the patent and should include that which is new in the art to which the invention pertains. Correction is required. See MPEP § 608.01(b).

***Claim Rejections - 35 USC § 112***

8. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

9. Claims 1-26 and 75 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. It is not clear what is meant by the following: a) "ideal lattice constant" (See Claim 1); b) "substantially randomly detuned ideal pattern" (See Claim 22); c) "the pattern is configured so that light emitted by the surface of the first layer has a spectrum of radiation modes, and the spectrum of radiation modes is substantially the same as a characteristic emission spectrum of the light-generating region" (See Claim 23); and d) the surface of the first layer has features with a size of less" (See Claim 75). Claims 2-21 and 24-26 depend directly or indirectly from a rejected claim and are, therefore, also rejected under 35 U.S.C. 112, second paragraph for the reasons set above.

***Double Patenting***

10. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686

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F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

11. Claims 1-26 and 75 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-90 of U.S. Patent No. 6,381,302. Although the conflicting claims are not identical, they are not patentably distinct from each other.

In regards to claims 1-26 and 75, Erchak et al. ("Erchak") discloses the following:

a) a light emitting device, multi-layer stack of materials, a first layer configured so that light generated can emerge, dielectric function that varies spatially, an ideal lattice constant and a detuning parameter that has a value greater than zero (See Claims 1-90).

### ***Claim Rejections - 35 USC § 103***

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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13. Claims 1-5, 10-12, 14-25 and 75, as far as understood, are rejected under 35

U.S.C. 103(a) as being unpatentable over Razeghi (U.S. Patent No. 5,834,331) in view of Lester (U.S. Patent No. 6,091,085) and Ishikawa et al. (U.S. Patent No. 6,426,515).

In regards to claim 1, Razeghi discloses the following:

a) a multi-layer stack of materials including a light-generating region (MQW region) and a first layer (n-GaN) supported by the light-generating region, wherein a surface of the first layer is configured so that light generated by the light generating region can emerge from the light-emitting device via the surface of the first layer (For Example: See Figure 1).

In regards to claim 1, Razeghi fails to disclose the following:

a) the surface of the first layer has a dielectric function that varies spatially according to a pattern and the pattern has an lattice constant.

However, Lester discloses the use of a layer has a dielectric function that varies spatially according to a pattern that has a lattice constant (For Example: See Column 5 Lines 30-49). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Razeghi to include the use of a layer having a dielectric function that varies spatially according to a pattern as disclosed in Lester because it aids in providing a device with a higher light coupling efficiency (For Example: See Column 2 Lines 10-13).

Additionally, since Razeghi and Lester are both from the same field of endeavor (semiconductors), the purpose disclosed by Lester would have been recognized in the pertinent art of Razeghi.

b) a detuning parameter with a value greater than zero.

However, Ishikawa et al. ("Ishikawa") discloses a detune with a value greater than zero (For Example: See Column 11 Lines 6-8). It would have been obvious to one having ordinary



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skill in the art at the time the invention was made to modify the semiconductor device of Razeghi to include the use of a detune with a value greater than zero as disclosed in Ishikawa because it aids in preventing an increase in threshold current (For Example: See Column 11 Lines 14-16).

Additionally, since Razeghi and Ishikawa are both from the same field of endeavor (semiconductors), the purpose disclosed by Ishikawa would have been recognized in the pertinent art of Razeghi.

In regards to claim 2, Razeghi discloses the following:

a) the multi-layer stack of materials comprises a multi-layer stack of semiconductor materials (For Example: See Figure 1).

In regards to claim 3, Razeghi discloses the following:

a) the first layer comprises a layer of n-doped semiconductor material, and the multi-layer stack further comprises a layer of p-doped semiconductor material (For Example: See Figure 1).

In regards to claim 4, Razeghi discloses the following:

a) the light-generating region is between the layer of n-doped semiconductor material and the layer of p-doped semiconductor material (For Example: See Figure 1).

In regards to claim 5, Razeghi discloses the following:

a) a support that supports the multi-layer stack of materials (For Example: See Figure 1).

In regards to claim 10, Razeghi discloses the following:

a) the multi-layer stack of materials comprise semiconductor materials (For Example: See Figure 1).

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In regards to claim 11, Razeghi discloses the following:

a) the semiconductor materials are selected from the group consisting of III-V semiconductor materials, organic semiconductor materials and silicon (For Example: See Figure 1).

In regards to claim 12, Razeghi fails to disclose the following:

a) the pattern does not extend into the light-generating region.

However, Lester discloses the use of a pattern that does not extend into the light generating region (For Example: See Figure 7 and Column 5 Lines 30-49). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Razeghi to include the use of a pattern that does not extend into the light generating region as disclosed in Lester because it aids in providing a device with a higher light coupling efficiency (For Example: See Column 2 Lines 10-13).

Additionally, since Razeghi and Lester are both from the same field of endeavor (semiconductors), the purpose disclosed by Lester would have been recognized in the pertinent art of Razeghi.

In regards to claim 14, Razeghi fails to disclose the following:

a) the pattern extends beyond the first layer.

However, Lester discloses the use of a pattern that extends beyond the first layer (For Example: See Figure 7 and Column 5 Lines 30-49). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Razeghi to include the use of a pattern that extends beyond the first layer as disclosed in Lester because it aids in providing a device with a higher light coupling efficiency (For Example: See Column 2 Lines 10-13).

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Additionally, since Razeghi and Lester are both from the same field of endeavor (semiconductors), the purpose disclosed by Lester would have been recognized in the pertinent art of Razeghi.

In regards to claim 15, Razeghi discloses the following:

a) electrical contacts configured to inject current into the light-emitting device (For Example: See Figure 1).

In regards to claim 16, Razeghi discloses the following:

a) the electrical contacts are configured to vertically inject electrical current into the light-emitting device (For Example: See Figure 1).

In regards to claim 17, Razeghi fails to disclose the following:

a) the pattern is partially formed of a component selected from the group consisting of holes in the surface of the first layer, pillars in the first layer, continuous veins in the first layer, discontinuous veins in the first layer and combinations thereof.

However, Lester discloses the use of a pattern consisting of holes (For Example: See Figure 7 and Column 5 Lines 30-49). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Razeghi to include the use of a pattern consisting of holes as disclosed in Lester because it aids in providing a device with a higher light coupling efficiency (For Example: See Column 2 Lines 10-13).

Additionally, since Razeghi and Lester are both from the same field of endeavor (semiconductors), the purpose disclosed by Lester would have been recognized in the pertinent art of Razeghi.

In regards to claim 18, Razeghi fails to disclose the following:

a) the pattern is selected from the group consisting of triangular patterns, square patterns, and grating patterns.

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However, Lester discloses the use of a grating pattern (For Example: See Figure 7 and Column 5 Lines 30-49). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Razeghi to include the use of a grating pattern as disclosed in Lester because it aids in providing a device with a higher light coupling efficiency (For Example: See Column 2 Lines 10-13).

Additionally, since Razeghi and Lester are both from the same field of endeavor (semiconductors), the purpose disclosed by Lester would have been recognized in the pertinent art of Razeghi.

In regards to claim 19, Razeghi fails to disclose the following:

- a) the pattern is partially formed of holes in the surface of the first layer.

However, Lester discloses the use of a pattern that has holes (For Example: See Figure 7 and Column 5 Lines 30-49). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Razeghi to include the use of a pattern that has holes as disclosed in Lester because it aids in providing a device with a higher light coupling efficiency (For Example: See Column 2 Lines 10-13).

Additionally, since Razeghi and Lester are both from the same field of endeavor (semiconductors), the purpose disclosed by Lester would have been recognized in the pertinent art of Razeghi.

In regards to claim 20, Razeghi fails to disclose the following:

- a) the detuning parameter is at most about 25% of the ideal lattice constant.

However, the applicant has not established the critical nature of "the detuning parameter is at most about 25% of the ideal lattice constant." "The law is replete with cases in which the

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difference between the claimed invention and the prior art is some range or other variable within the claims. . . . In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range.” *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir.1990). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have various ranges.

In regards to claim 21, Razeghi fails to disclose the following:

- a) the detuning parameter is at least about 1% of the ideal lattice constant.

However, the applicant has not established the critical nature of “at least about 1% of the ideal lattice constant.” “The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. . . . In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range.” *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir.1990). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have various ranges.

In regards to claim 22, Razeghi fails to disclose the following:

- a) the pattern corresponds to a substantially randomly detuned ideal pattern.

However, Lester discloses the use of a pattern that corresponds to a substantially randomly detuned ideal pattern (For Example: See Figure 7 and Column 5 Lines 30-49). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Razeghi to include the use of a pattern that corresponds to a substantially randomly detuned ideal pattern as disclosed in Lester because it

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aids in providing a device with a higher light coupling efficiency (For Example: See Column 2 Lines 10-13).

Additionally, since Razeghi and Lester are both from the same field of endeavor (semiconductors), the purpose disclosed by Lester would have been recognized in the pertinent art of Razeghi.

In regards to claim 23, Razeghi fails to disclose the following:

a) the pattern is configured so that light emitted by the surface of the first layer has a spectrum of radiation modes, and the spectrum of radiation modes is substantially the same as a characteristic emission spectrum of the light-generating region.

However, Lester discloses the use of a pattern configured so that light emitted by the surface of the first layer has a spectrum of radiation modes, and the spectrum of radiation modes is substantially the same as a characteristic emission spectrum of the light-generating region (For Example: See Figure 7 and Column 5 Lines 30-49). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Razeghi to include the use of a pattern that configured so that light emitted by the surface of the first layer has a spectrum of radiation modes, and the spectrum of radiation modes is substantially the same as a characteristic emission spectrum of the light-generating region as disclosed in Lester because it aids in providing a device with a higher light coupling efficiency (For Example: See Column 2 Lines 10-13).

Additionally, since Razeghi and Lester are both from the same field of endeavor (semiconductors), the purpose disclosed by Lester would have been recognized in the pertinent art of Razeghi.

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In regards to claim 24, Razeghi discloses the following:

a) the light-emitting device is selected from the group consisting of light-emitting diodes, lasers, optical amplifiers, and combinations thereof (For Example: See Abstract).

In regards to claim 25, Razeghi discloses the following:

a) the light-emitting device comprises a light emitting diode (For Example: See Abstract).

In regards to claim 75, Razeghi fails to disclose the following:

a) the surface of the first layer has features with a size of less than about  $\lambda/5$ , where  $\lambda$ , is a wavelength of light that can be generated by the light-generating region and that can emerge from the light-emitting device via the surface of the first layer.

However, the applicant has not established the critical nature of “the surface of the first layer has features with a size of less than about  $\lambda/5$ .” “The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. . . . In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range.” *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir.1990). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have various ranges.

14. Claim 26, as far as understood, is rejected under 35 U.S.C. 103(a) as being unpatentable over Razeghi (U.S. Patent No. 5,834,331) in view of Lester (U.S. Patent No. 6,091,085), Ishikawa et al. (U.S. Patent No. 6,426,515) and Choi (U.S. Publication No. 2003/0222263).

In regards to claim 26, Razeghi fails to disclose the following:

a) the light-emitting device is selected from the group consisting of OLEDs, flat surface-emitting LEDs, HHLEDs, and combinations thereof.

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However, Choi discloses the use of a high efficiency led (For Example: See Paragraph 1). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Razeghi to include the use of a high efficiency led as disclosed in Choi because it aids in improving efficiency (For Example: See Abstract).

Additionally, since Razeghi and Choi are both from the same field of endeavor (semiconductors), the purpose disclosed by Choi would have been recognized in the pertinent art of Razeghi.

***Allowable Subject Matter***

15. Claims 6-9 and 13 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

***Conclusion***

16. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Monica Lewis whose telephone number is 571-272-1838. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on 571-272-1852. The fax phone number for the organization where this application or proceeding is assigned is 703-308-7722 for regular and after final communications. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956

ML  
December 20, 2004



**Mary Wilczewski**  
**Primary Examiner**



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